E/CONF.39/D/152
2 Nov.1962
ORIGINAL : ENGLISH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item : D. 4. 2

Australia

SIMPLE TECHNIQUES FOR THE BULK HANDLING AND STORAGE OF FRUIT

By E. G. HALL

and J. D. MELLOR,
Commonwealth Scientific
and Industrial Organization,
Division of Food Preservation,
Sydney, New South Wales, Australia

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

SIMPLE TECHNIQUES FOR THE BULK HANDLING AND STORAGE OF FRUIT.

by E.G. Hall and J.D. Mellor, Commonwealth Scientific and Industrial Organization, Division of Food Preservation, Sydney, New South Wales, Australia.

1. Since its first introduction into the apple industry in New Zealand in 1953 several kinds of bins have been used successfully in Australia for the bulk harvesting, transporting and cool storage of apples, pears, citrus and, to a lesser extent, canning peaches. Bins, of more expendable nature, are also being used increasingly for the export of apples and pears to markets in the northern hemisphere.

2. Intelligently used, bulk handling can facilitate operations and both greatly reduce labour and container costs and capital outlay on equipment may be recouped within a few years. By bulk bins, larger net loads may be carried on transport vehicles, thus greatly reducing carrying costs on long hauls, and by their use in suitable cool stores a gain of up to 10% in storage space may be made. Also indirect saving may result from the fruit being less bruised and from the slightly longer storage life obtained.

BULK HANDLING

3. Harvesting. In small orchards trailer bins, mounted on pneumatic tyred wheels, are often convenient; or low level tip carts, may be used. In larger orchards bins may be left on a trailer and when filled hauled by tractor to nearby road transport or directly to the packing shed. In larger orchards bulk bins, placed conveniently on the ground, are lifted onto the transport lorry by retractable boom jib hoist (if fitted to lorry), by fork lift tractor or by manual labour. For longer hauls of bins from the orchard, special straddle trucks are often more economical.

4. Storage. With suitable equipment the filled bulk bins can be stacked in the cool store easily. After allowing for the small gaps between bins necessary for cooling, there is usually as much as a 10% gain in storage space. If the floor boards of the bins are spaced to 7-10% of the bottom open, a rapid cooling of apples, pears and also canning peaches is possible. Both packing sheds and cool rooms should have level, heavy duty floors, preferably of concrete. New packing sheds should provide plenty of floor space and cool rooms be built to accommodate bins stacked up to seven high, especially if electrically operated fork-lifts are to be used. Doorways should be sufficiently large for fork-lift operations and in cool stores be fitted with air curtains or other means of minimizing the entry of hot air.

5. Orchard Bins: Since they are used many times during the season.

Conway, T., Developments in mechanical and bulk handling of fruit. N.Z.J. Agric. 94: 534 (1957).

Hall, E.G., and Mellor, J.D., Bulk bins for fruit storage, Commonwealth Scientific and Industrial Organization. Food Pres. Quart., 22, 49 (1962).

bins used in the orchard must be of strong construction. They may have slatted sides and floors and are commonly made with a full width, top hinged side gate, 10in high and opening at floor level to permit fruit to slide out readily when the bin is tilted. Where fruit is to be washed it is often convenient to float it out of the bins.

6. Containers for Transport: For convenience of return the bulk containers, of metal or wood, for transport of fruit to packing stations or markets may be collapsible, or of a type that when empty, may fit into each other. Such kinds of containers are still very much in the developmental stage in Australia but a start is being made to transport citrus and apples in bulk from producing areas to processing or consuming centres. These fruits seem to travel much better in bulk than when packed in wooden boxes. It is of interest that potatoes are shipped successfully from the island State of Tasmania to Sydney and Brisbane in steel bins of approximately two tons (2,000 kilo) capacity.

7. Storage Bins: It is common practice in Australia for apples and pears to be placed directly in storage bins on picking and for grading to be carried out when the fruit is taken out of cool storage. Less common is the filling of the storage bins in the store with graded fruit.

8. Expendable Bins for Export: The use for export of expendable pallet base bulk bins holding 20-25 bushels (about 500 kilo) of apples or pears, which was pioneered in Australia, has enabled shipments to countries in the northern hemisphere, showing good out-turns of unbruised fruits.

9. Dimension of Bins: The dimensions of bulk containers have been varied according to the type of fruit, the transport and handling equipment available, and, on occasion, to meet other special requirements. Wherever possible bins should be of a standard size. Since, in Australia, the bodies of road vehicles are usually made to conform to a maximum loading width of 8 ft, square bins slightly under 4 ft x 4 ft and having an internal height of 2 ft have proved convenient. Figure 1 shows two types of bins, holding about 20 bushels of apples or pears, in common use in Australia.

10. Design: The design of bins should be such that they are durable, of rigid construction, and resistant to torsional stresses, with adequate pallet space and smooth internal surfaces. The floor boards should be spaced to leave 7-10% of the bottom open, especially when rapid cooling is required. Export bins, normally used only once, need not be so strongly constructed. Many export bins are made of hardboard well secured to a wooden frame.

11. Construction: To obtain strength and rigidity at reasonable cost experience has shown a type of bin, having 3 in x 3 in triangular corner posts with sides of $\frac{1}{2}$ in plywood or diagonally braced boards, not less than 3/4 in thick, to be satisfactory. (Figure 11) The sides may also be of hardboard, lighter plywood or vertical boards, attached to a diagonally braced frame. To minimize damage to the fruit the inside edges of the floor boards, placed $\frac{1}{2}$ in apart, need to be bevelled to a 20° angle. The clearance space left for the fork-lift in a pallet base bin should not be less than $2\frac{1}{2}$ in and preferably 3 in. For ready emptying a full width top-hinged side gate 8-10 in high is usually provided. Square shank twisted flat headed (pallet) nails should be used.

LIFTING AND MOVING TECHNIQUES

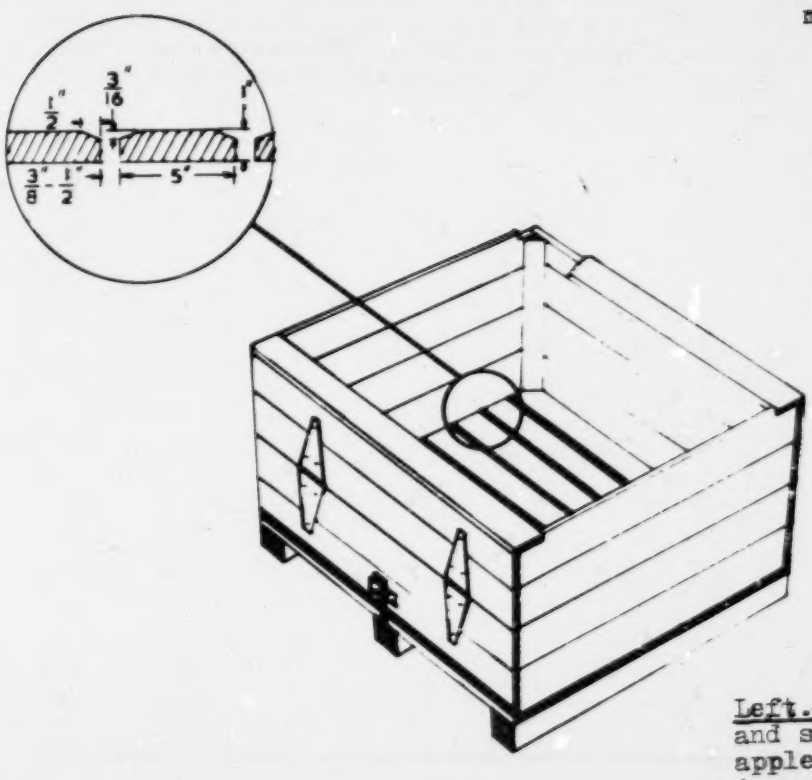
12. In the Orchard: Some form of fork-lift is necessary when handling palletized units. Most farm tractors, equipped with hydraulic lifting gear, can be easily fitted, either in front or rear, with fork-lift attachments. If the grower does not own a tractor, hooks or rings may be fitted to the bins to enable them to be lifted by a jib crane mounted on the transporting vehicle. The crane may also be used to unload the bins at their destination.

13. At the Packing Shed: On arrival at the packing shed or cool store the filled bins may be moved by fork-lift equipment, hoist, gantry, or a roller conveyor. Since the fumes of internal combustion engines may endanger the lives of the workers and have a deleterious effect on the fruit, fork-lifts used in cool stores or other confined spaces should be powered by batteries or manually operated. A cheaply constructed but efficient hand operated fork-lift may be used which has a lifting device operated either hydraulically or by means of a winch and cable. The usual way of emptying a pallet base bin is by placing it inaa support and tilting it through an angle of approximately 35° so that the fruit slides either directly into a hopper or on to a grader belt. The various types of equipment used in Australia for handling bulk bins have been described in some detail by Fleming and Wilson.

14. Trailer Bins: Trailer bins are most conveniently emptied by tipping them to allow the fruit to slide out on to a floor level conveyor which elevates them to a hopper or grader. Sometimes the fruit is fed directly into a hopper after the trailer has been backed on to an elevated ramp.

Fleming, C.B., and Wilson, A.G.L., Bulk handling of apples and pears, Tas. J. Agric. 31, 98 (1960).

Showing Fig. 1. Two types of bulk bins mounted on a trailer.



Left. Fig.II. Orchard and storage bin for apples and pears, showing method of construction, bottom venting, gate for removal of fruit.

1530 E - Nov. 1962 - 1,600